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3. Cuppels, N.P., 1963, Geology of the Clifton Quadrangle, Wyoming and

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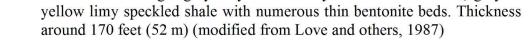
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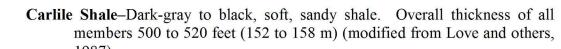
southwest part of the Clifton Quadrangle, Weston County,

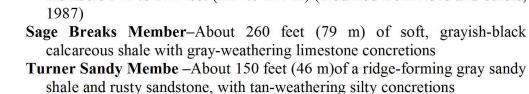
Wyoming: U.S. Geological Survey Mineral Investigations Field

MAP SERIES 71 Newcastle 1:100,000 - Scale Geologic Map

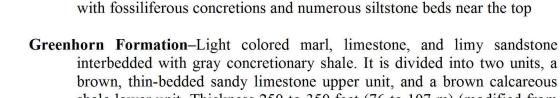
Niobrara Formation-Light-gray to yellow chalky marl and limestone; gray to

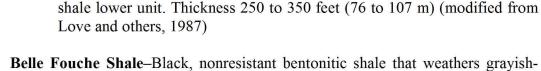


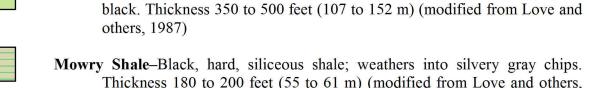




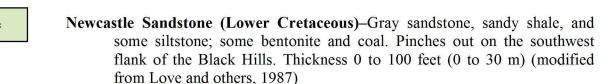
Unnamed lower member-90 to 110 feet (27 to 34 m) of dark-gray shale

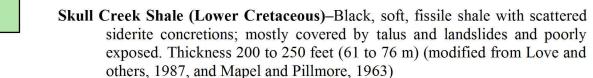




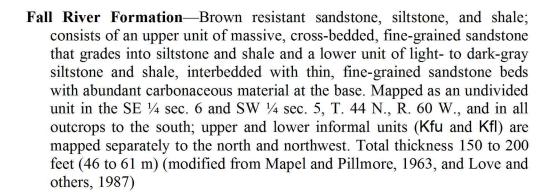


Lower Cretaceous and Jurassic sedimentary rocks





Inyan Kara Group (Lower Cretaceous)



Upper Fall River Formation—Top of unit is 10 to 30 feet (3 to 9 m) of thinbedded, nonresistant slitstone, sandstone, and snale, grading upward into the overlying black marine shale of the Skull Creek Shale. This uppermost unit is underlain by one or more resistant, massive to subtly cross-bedded layers of well-sorted, fine- to very fine-grained, friable, tan-weathering sandstones that usually form ledges and cliffs, but in places they thin and interfinger with siltstone (Mapel and Pillmore, 1963). Total thickness as mapped to the north in the Sundance 30 x 60 Quadrangle (Sutherland, 2007) 70 to 80 feet (21 to 24 m)

Lower Fall River Formation—Nonresistant, dark-gray silty shale and siltstone, thinly interbedded with yellowish- to light-gray, fine-grained sandstone and siltstone; forms steep grassy slopes. The lower 20 to 40 feet (6 to 12 m) of the unit is dominated by dark-gray carbonaceous shale and siltstone (Bergendahl, Davis, and Izett, 1961; Mapel and Pillmore, 1963). Total thickness as mapped to the north in the Sundance 30 x 60 Quadrangle (Sutherland, 2007) approximately 60 to 65 feet (18 to 20 m)

Lakota Formation-Intertongued, variegated claystone and sandstone

Chilson Member. Thickness 200 to 250 feet (61 to 76 m) (modified from

underlain by gray conglomeratic sandstone; gold-bearing coal bed near the base. A local unconformity in the northern part of the Newcastle area divides the Lakota into upper and lower parts of contrasting lithology (not mapped for this report). The upper conglomeratic part corresponds to the Fuson Member, while the lower coal-bearing part corresponds to the

Mapel and Pillmore, 1963)

Morrison Formation (Upper Jurassic)-Dull variegated siliceous claystone containing nodular limestone and gray silty sandstone lenses. Thickness 50 to 100 feet (15 to 30 m) (from Love and others, 1987)

Sundance and Gypsum Spring formations undivided

Sundance Formation (Upper and Middle Jurassic)-Individual members described below; overall thickness 357 to 409 feet (109 to 125 m)

(modified from Mapel and Pillmore, 1963, and Love and others, 1987) Redwater Shale Member-About 160 (49 m) feet of greenish gray shale with interlaminated siltstone and sandstone

Gypsum Spring Formation (Middle Jurassic)-Massive white gypsum and

Lak Member-About 75 feet (23 m) of friable pink noncalcareous siltstone and fine-grained sandstone Hulett Sandstone Member-About 70 feet (21 m) of light-gray to yellowish calcareous sandstone

Stockade Beaver Shale Member-50 to 65 feet (15 to 20 m) of soft, greenish-gray shale and siltstone Canyon Springs Sandstone Member-2 to 19 feet (0.6 to 6 m) of finegrained, friable, calcareous sandstone

red shale; up to 20 feet (6 m) thick (from Love and others, 1987)

Triassic and Permian sedimentary rocks

Spearfish Formation (Triassic and Permian)-Red shale, red siltstone, and white gypsum beds; divided locally into two units, a lower unit of thinbedded red claystone and clayey siltstone interbedded with white, granular gypsum beds and an upper unit of mostly red silty claystone with some Lance Formation—Somber-colored shale and drab, massive, lenticular, sandstone. Gypsum is present as secondary fracture sills near the top. concretionary sandstones; many thin coal beds in the lower half. Thickness 150 to 550 feet (46 to 168 m) (modified from Mapel and Pillmore, 1963, and Love and others, 1987)

Paleozoic sedimentary rocks

Minnekahta Limestone and Opeche Shale undivided

Minnekahta Limestone (Lower Permian)-Gray, slabby, thin-bedded limestone, pink on outcrop. Thickness 0 to 40 feet (0 to 12 m) (modified from Love and others, 1987)

Opeche Shale (Lower Permian)-Reddish brown and maroon fine-grained sandstone, siltstone, and shale. Thickness 75 to 160 feet (23 to 49 m) (modified from Love and others, 1987)

Minnelusa Formation (Lower Permian and Pennsylvanian)-Light gray and ₽₽m red sandstone, breccias that merge with anhydrite in subsurface, thin

1,300 feet (274 to 396 m) (Love and others, 1987) Pahasapa Limestone and Englewood Formation, undivided

Pahasapa Limestone (Lower Mississippian-Gray, massive, locally cavernous, dolomitic limestone. Thickness 300 to 600 feet (91 to 183 m) (Love and others, 1987) Englewood Formation (Lower Mississippian and Upper Devonian)-Pink, slabby, dolomitic limestone. Thickness 50 to 60 feet (15 to 18 m) (Love and others, 1987)

limestone and dolomite beds, and red and black shale. Thickness 900 to

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JURASSIC Middle Jurassic Upper Permian

Upper Devonian

Lower Cretaceous

MAP SYMBOLS

EXPLANATION

CORRELATION OF MAP UNITS

QUATERNARY

CRETACEOUS

Contact-May be approximately located in areas of poor exposures

Fault-Dashed where approximately located and dotted where concealed. Bar and ball on downthrown block. No indication on fault trace indicates undetermined motion

Anticline-Trace of axial plane and direction of plunge

Monocline-Trace of axial plane compiled from source mapping or determined by field dip measurements or photo interpretation. Arrows point in direction

Alluvium and colluvium (Holocene/Pleistocene)-Sand, silt, clay, and gravel

deposited mainly along intermittent streams; includes slope wash and

fine-grained rock debris deposited by mass wasting events. Thickness

DESCRIPTION OF MAP UNITS

Quaternary surficial deposits

Alluvial deposits (Holocene)-Unconsolidated and poorly consolidated clay, silt, sand, and gravel, mainly in floodplains and terraces along major drainages. Thickness varies

smaller alluvial fan deposits that coalesce with alluvium. Thickness varies Terrace deposits (Holocene/Pleistocene)-Poorly consolidated deposits of

silt, sand, and gravels forming flat terraces and benches. Thickness 5 to 12 feet (1.5 to 3.7 m) Landslide deposits (Holocene/Pleistocene)-Chaotically mixed boulders and

Loess (Holocene/Pleistocene)-Eolian deposits of unconsolidated, brown-gray silt and sand. Thickness 0 to 5 feet (0 to 1.5 m)

Spring deposits (Holocene/Pleistocene)-Porous deposits of calcium carbonate formed by springs. White to tan with abundant leaf and twig impressions. Thickness of a few feet (less than 1 m)

Tertiary sedimentary rocks

Fort Union Formation (Paleocene)

Tongue River and Lebo Members—The upper part (Tongue River) is a finegrained drab to gray sandstone, finely conglomeratic in places, interbedded with drab siltstone, claystone, and shale, with thick coal beds near the top. The lower part (Lebo) is gray shale and claystone. Thickness 0 to 2,500 feet (0 to 762 m) (Love and others, 1987) Tullock Member-Darker than the Lebo member and contains massive sandstone. Thickness 0 to 1,500 feet (0 to 457 m) (Love and others, 1987)

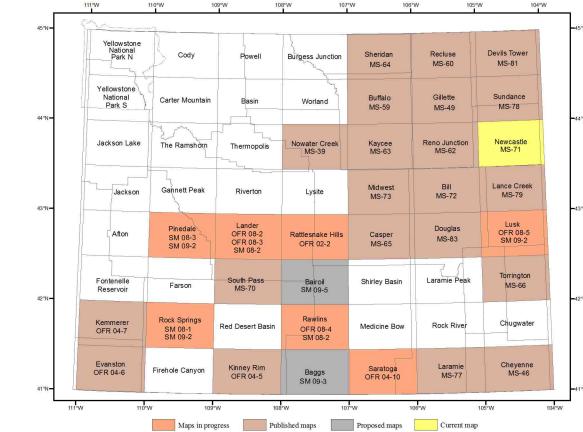
Upper Cretaceous sedimentary rocks

Thickness 2,000 to 2,500 feet (607 to 762 m) (Love and others, 1987) Fox Hills Sandstone–White to light gray sandstone and gray, sandy shale containing marine fossils. Thickness 150-200 feet (46 to 61 m) (Love and

Pierre Shale-Dark-gray to black, concretionary marine shale. Overall thickness

of all members 2,045 to 2,290 feet (623 to 698 m) (modified from Love and others, 1987, and Mapel and Pillmore, 1963) Kara Bentonitic Member–Gray bentonitic shale, 25 feet (8m) thick overlain by 50 to 100 feet (15 to 30 m) of dark-gray shale **Red Bird Silty Member**–Dark-gray shale that is silty and sandy at the base; poorly exposed. Thickness 1,100 to 1,200 feet (335 to 366 m) Mitten Black Shale Member–Hard, dark-gray fossiliferous shale that weathers medium-gray to brown; typically supports little to no vegetation. Includes numerous, thick bentonite beds near the base relating to both the Ardmore Bentonite Bed and the Pedro Bentonite Bed. Lower part of the member is equivalent to the Sharon Springs Member of the Pierre Shale. Thickness 835 to 920 feet (255 to 280 m) Gammon Ferruginous Member–Dark-gray shale lies between a

prominent zone of bentonite beds (above) and the Niobrara Formation (below). Thickness 35 to 75 feet (11 to 21 m)



KEY TO ABBREVIATIONS U.S. Geological Survey maps: Miscellaneous Investigations Series (I). Wyoming State Geological Survey maps: Map Series (M), Open File Report (OFR), Preliminary Geologic Map (PGM), Hazards Section Digital Map (HSDM), and unpublished STATEMAP project (SMP).

INDEX TO 1:100,000-SCALE BEDROCK GEOLOGIC MAPS OF WYOMING

INDEX TO GEOLOGIC MAPPING

Geological Survey Map Series (MS) 78, map, scale 1:100,000,

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Quadrangle: Wyoming State Geological Survey Open File Report

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color, and pamphlet, 27 p.

OFR 87-1H, scale 1:250,000, blackline.

western South Dakota: Wyoming State Geological Survey Map

basin and adjacent areas, Wyoming: U.S. Geological Survey Oil

Weston County, Wyoming: U.S. Geological Survey Bulletin 1141-

Love, J.D., and Weitz, J.L., 1951, Geologic map of the Powder River

and Gas Investigations Map OM-122, scale 1:316,800, color.

8. Mapel, W.J., and Pillmore, C.L., 1963, Geology of the Newcastle area,

Series 25-I, scale 1:250,000, color.

N, scale 1:48,000, color.

WYOMING QUADRANGLE LOCATION MAP

(numbers are those listed in the References and sources of geologic data)